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### Perceptions of kneeling ability after total knee arthroplasty

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## Perceptions of Kneeling Ability After TKA

R Benfayed\*, M Moran, AHRW Simpson and D Macdonald

Department of Orthopaedics and Trauma, University of Edinburgh, South Bridge, Edinburgh, United Kingdom

### Abstract

**Background:** Kneeling is an important function for many activities of daily life including employment, social and religious practices. Different activities require different patterns of kneeling (upright and high flex kneeling patterns). This study investigates patients' perception of kneeling ability.

**Methods:** Three hundred consecutive patients undergoing Total Knee Arthroplasty (TKA) in Royal Infirmary of Edinburgh received patient specific kneeling ability questionnaires along with the Oxford Knee Score (OKS) pre-operatively and one year after surgery. The 'kneeling ability questionnaire was constructed to determine: (1) The ability to adopt one or more of 4 kneeling positions demonstrated in 4 simple illustrations rated on a 4-point Likert scale (0=Impossible, 1=with extreme difficulty, 2=with moderate difficulty, 3=with little difficulty, 4=Easily) pre-operatively and one-year postoperative. The kneeling positions represent different degrees of knee flexion and knee contact with the ground. (2) If unable to kneel, the reason for the inability to kneel. (3) Specific instructions about kneeling given by health care professionals before and after surgery.

**Results:** 251 patients (147 women and 104 men) responded and completed the questionnaires (response rate 84%). The main reasons for kneeling difficulties were pain (111/251), medical problems (77/251), and numbness around the knee (41/251). Most of the patients (147/251 i.e., 63.6%), received advice regarding kneeling before or after TKA; 132 patients (59%) were advised not to kneel after TKAs from the arthroplasty nurse practitioner, 45 patients (20%) received the advice not to kneel after TKAs from their consultants, 29 patients (13%) received the advice not to kneel from their GPs and 9 patients (4%) received the advice not to kneel from their physiotherapists. One hundred and eighty three patients responded to both OKS kneeling question and the kneeling questionnaire preoperatively, and one year after surgery, 15 patients could kneel easily before TKA, this number decreased to 5 patients after TKA; on the other hand 51 patients answered impossible to kneel before TKA and this number increased to 72 patients after TKA. The positive correlation noticed between the OKS kneeling question and the kneeling questionnaire responses showed the strong correlation with the upright kneeling patterns. The data suggest that a high percentage of TKA patients experience postoperative kneeling difficulties. 96% of patients responded that were advised by a health care professionals not to kneel.

**Conclusion:** 1. Kneeling is a problem to many patients after TKA. This may have important consequences for work/religious and social life after TKA. 2. Patients are frequently advised not to kneel after TKA. The higher percentage could be because of miss-understanding of the advice. 3. Kneeling questionnaire correlates well with OKS kneeling question. 4. Kneeling is not a single position of the knee and can be interpreted in different ways by different patients.

**Keywords:** Arthroplasty; Knee; Kneeling; Preoperative; Postoperative; Oxford knee score; Perception; Reality

### Introduction

Various knee-scoring systems have been developed to assess knee function after surgical procedures [1]. Focusing on a scoring system-assessing outcome after knee arthroplasty, in 1989 the "American Knee Society" group published the "American Knee Society Score" (AKSS), which is an examiner-dependent clinical evaluation system, this was divided into two components. The first assessed the knee clinically with a physical examination (Clinical AKSS - "Knee Score"), and the second assessed the individual's 'functionality' (Functional AKSS - "Function Score") [2]. In more recent studies, there has been a shift toward scores that use the patient's evaluation, such as the Short Form 36 [3]. Dawson, Fitzpatrick and Murray, using the Oxford knee score questionnaire on the perception of patients about knee arthroplasty, concluded that Questionnaires were a sensitive measure of outcome for total knee arthroplasty [4]. However, with kneeling, there is a need for a careful comparison of the patients' perception and the objectively assessed ability to kneel [5].

A limited number of studies exist on the ability to kneel after surgery for osteoarthritis of the knee compared with studies on other knee functions [6-9]. In a previous work by Hassaballa et al. on kneeling ability after different arthroplasty procedures, a patient-based questionnaire was used to collect data and demonstrated a low

rate of kneeling ability [7]. The OKS and KS-P (Knee Society clinical rating system) are more responsive than the SF-36 (general Health status measure short form 36) in TKA patients [10]. The current study investigates the patient's reported ability to kneel in different positions after TKA and to assess whether the kneeling question in OKS relates to the various patterns of kneeling.

### Materials and Methods

Three hundred TKA consecutive patients received self-completed patients based kneeling ability questionnaires one year after their operations, all the TKAs performed at the Royal Infirmary of Edinburgh (RIE) by 12 orthopaedic consultants. The patients had been operated on over a period of seven months from March 2013 to November 2013. The study population is representative of the wider population in that

**\*Corresponding author:** R Benfayed, Department of Orthopaedics and Trauma, University of Edinburgh, South Bridge, Edinburgh EH8 9YL, United Kingdom, Tel: + 0131 242 6644; Fax: +788 122 0763; E-mail: [r.benfayed@sms.ed.ac.uk](mailto:r.benfayed@sms.ed.ac.uk)

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the subjects were not 'selected' rather they were consecutive knee replacement patients having surgery for primary osteoarthritis.

Two hundred and fifty-one patients (147 Women and 104 Men) responded and completed the questionnaires. The response rate (84%) is in line with the normal response rate for the department. Forty-nine patients did not return the questionnaire; reminder questionnaires were not sent. The mean age of the patients was  $68.3 \pm 8.8$  years (44.2 to 93.6), 143 underwent Right TKA and 108-Left TKA.

Patient demographics were included along with The 'kneeling ability' questionnaire which includes questions to determine (1) the reasons for any kneeling problems, (2) if they had been given any instructions concerning kneeling and if so by whom and (3) the type of kneeling positions they could and could not do. For this latter component, 6 images (Figure 1) showing different kneeling positions and different amounts of knee flexion for normal daily activities were depicted, and the patients asked to indicate on a 4-point scale (4=easily to 0=impossible) how easily they could get into this position before and after TKA. Finally, the importance of kneeling function and knee flexion for each patient was assessed by the patient on a scale of (0-100).

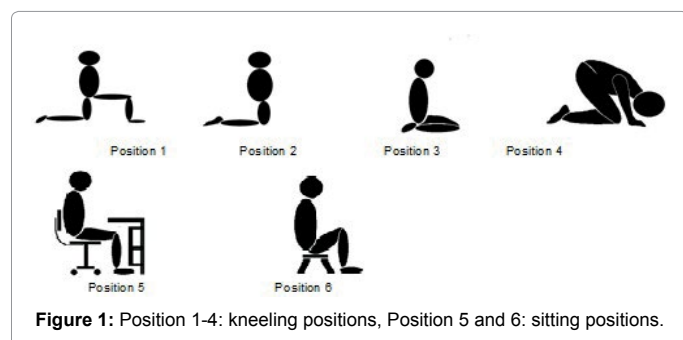
The department routinely follows up arthroplasty patients at six months and one year following their surgery. The Three hundred questionnaires were sent to consecutive patients who had primary unilateral TKA. No patient was deemed unsuitable; there were no inclusion or exclusion criteria as such only that it be a primary surgery for a diagnosis of osteoarthritis.

Patients were contacted by letter including a questionnaire and were asked to complete the OKS and the kneeling questionnaire. SPSS statistical software package, version 21.0 was used for statistical analysis. Data were expressed as numbers (%) or mean  $\pm$  SD. Descriptive statistical analysis including reasons of kneeling difficulty, pre and post-operative responses in all patterns of kneeling and responses to the kneeling question of OKS.

## Results

Table 1 gives the causes of kneeling problems after TKA. Pain and medical problems were the main reasons for kneeling difficulties and were found in 75% of TKA patients (188/251), 41 patients blamed numbness around the knee as the main cause which accounts for 16% (41/251) of patients.

Most of the patients (147/251 i.e., 63.6%), received advice regarding kneeling before or after TKA, 59% of patients received the advice not to kneel after TKAs from the arthroplasty nurse practitioner, 45 patients (20%) received the advice not to kneel after TKAs from their consultants, 29 patients (13%) received the advice not to kneel from their GPs and 9 patients (4%) received the advice not to kneel from their physiotherapists (Tables 2 and 3).



Difficulty Kneeling	N	%
Pain	111/251	44
Medical Problems	77/251	31
Numbness	41/251	16
Other joint problems	26/251	10
Other	9/251	4

**Table 1:** Reasons for kneeling difficulty.

Advice	N	%
No advice given	84	36
Yes, advice given	147	64

**Table 2:** Advice about kneeling before or after TKA.

Advice- Not to kneel after TKA	N	%
Consultant	45	20
GP	29	13
Physiotherapist	9	4
Nurse Practitioner	132	59
Other	8	4

**Table 3:** Health professionals' advice about kneeling (not to kneel after TKA).

## Upright kneeling on operated knee (position 1)

Changes in the kneeling ability before and after TKA was noted in, only 8.2% and 10.3% of patients could kneel on the operated knee easily preoperative and postoperative respectively. Before TKA 58.4% found that kneeling on affected knee was either extremely difficult or impossible, whereas 1 year after surgery, 63.4% reported that it was extremely difficult or impossible to kneel on the operated knee (Figure 2).

The most common reason behind the inability to kneel for most patients was the operated knee (44.2% pre-operatively and 45.8% post-operatively). Less commonly was the other knee (15.9% pre-operatively and 19.9% post-operatively, and any other reason might affect their kneeling ability (6.8% pre-operatively and 4.8% post-operatively).

## Upright kneeling on both knees (position 2)

Only 6.7% of patients were able to kneel on both knees pre-operatively, 67% of patients reported this position to be either extremely difficult or impossible (Figure 3), and the majority of patients (51.4%) responded that the operated knee restricted them from this pattern of kneeling.

## Kneeling at full flexion (position 3)

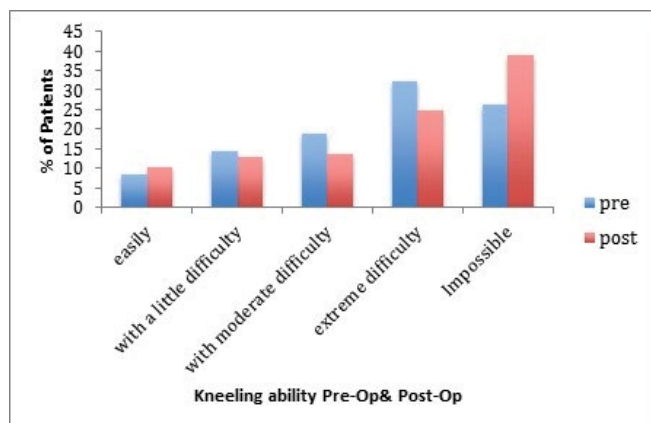
This position was the most awkward position for most of the patients, 86.5% responded either extremely difficult or impossible, and only 5.9% were able to kneel with little difficulties (Figure 4). 53.8% of patients could not kneel because of the operated knee.

## Kneeling with hands on the ground (position 4)

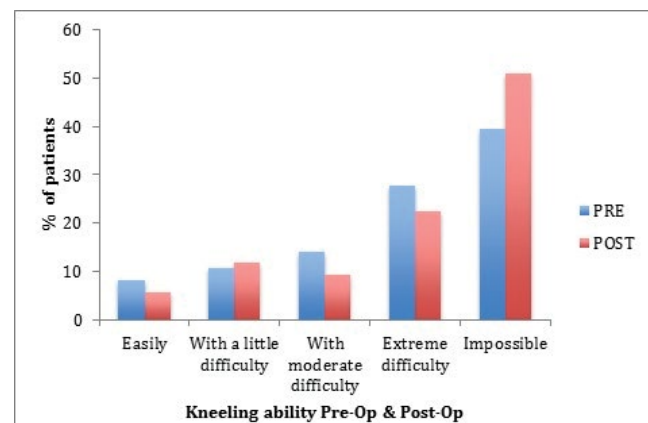
The pre-operative findings for this position range from 8.1% answered easily to achieve the position, and 39.6% answered impossible, the postoperative findings ranged from 5.6% answered easily to achieve the position and 50.9% answered impossible (Figure 5). The operated knee was the most common cause of kneeling problems for most of the patients (46.2% pre-op and 47.8% post-op); less commonly was the other knee (27.5% pre-op and 24.3% post-op), and other reasons (5.6% pre-op and 6% post-op).

## Sitting on a chair with knees flexion 90°

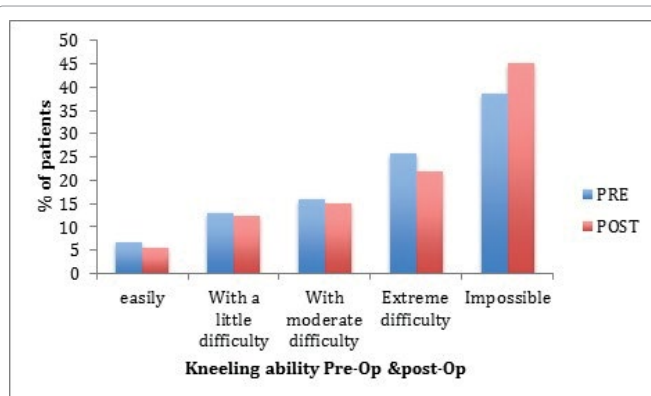
This position can be performed by most of the patients, and only



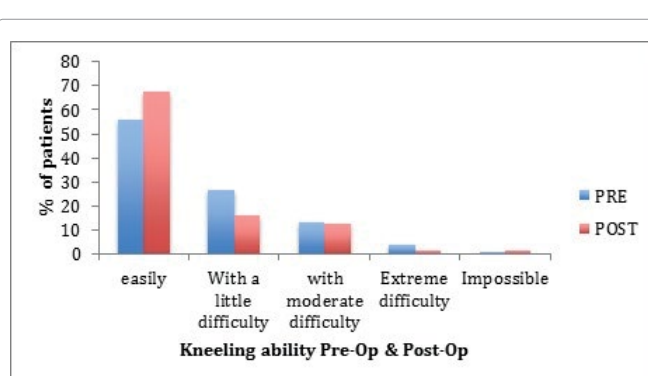
**Figure 2:** Pre and post-operative change of kneeling ability /upright kneeling on operated knee (position 1).



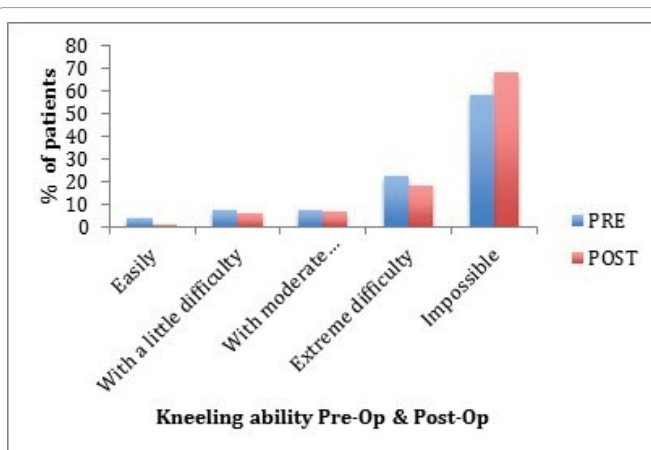
**Figure 5:** Pre and post-operative change of kneeling ability/kneeling with hands on the ground (position 4).



**Figure 3:** Pre and post-operative change of kneeling ability/upright kneeling on both knees (position 2).



**Figure 6:** Sitting on a chair with knees flexion 90 degrees.



**Figure 4:** Pre and post-operative change of kneeling ability /kneeling at full flexion (position 3).

small percentages find it either extremely difficult or impossible (1.7% post-op) (Figure 6).

### Sitting on a low- level seat with knee flexion more than 90°

This position is a difficult position for many patients preoperatively and postoperatively, only 14.5% can perform this position easily preoperatively and 18.1% postoperatively, (Figure 7).

### Reasons for not kneeling or sitting

In assessing reasons given by patients for not kneeling (pre-op and post-op), it was noted that the majority of patients gave reasons because of the operated knees in all positions (Figures 8 and 9). The data based on only patients who responded unable to kneel pre-operatively and post-operatively (P1 position 66.9% of patients, P2 position 77.7%, P3 position 90.1%, P4 position 79.3%, P5 position 26.3 and P6 position 61.3%); the other percentages of patients responded able to kneel easily.

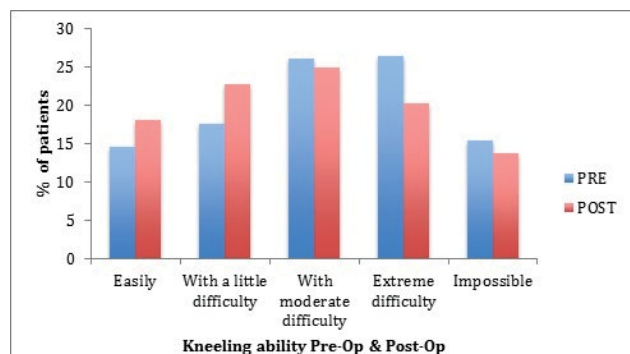
### Kneeling question in oxford knee score

One hundred and eighty-three patients (183/251-102 Women, 81 Men) responded and completed both the kneeling questionnaire and OKS kneeling question preoperatively, and one year after surgery, The mean age of the patients was  $67.1 \pm 8.3$  years, 92 underwent Right TKA and 91-Left TKA (Table 4 and Figure 10).

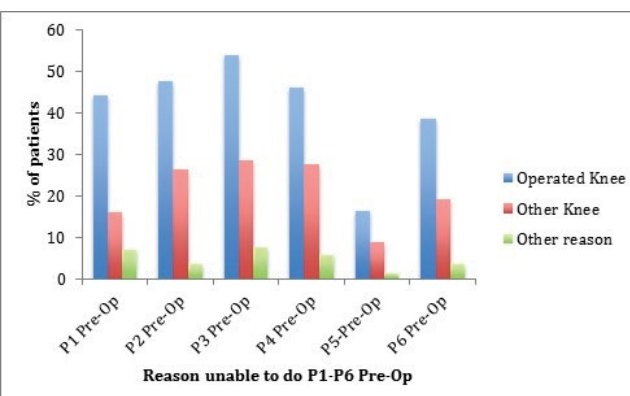
### Correlation between responses to OKS kneeling question and the kneeling questionnaire

For those patients that answered the kneeling question in the Oxford score, there may have been variability in what the patient considered to be 'kneeling'. Therefore in the questionnaire, clear images for different kneeling positions were used. The patients, even those from different cultures for whom "to kneel" refers to various knee positions, did not report any difficulties with understanding the knee positions depicted. Figure 11 shows the differences in the pre-operative and post-operative responses to both OKS kneeling question and this thesis' kneeling questions.

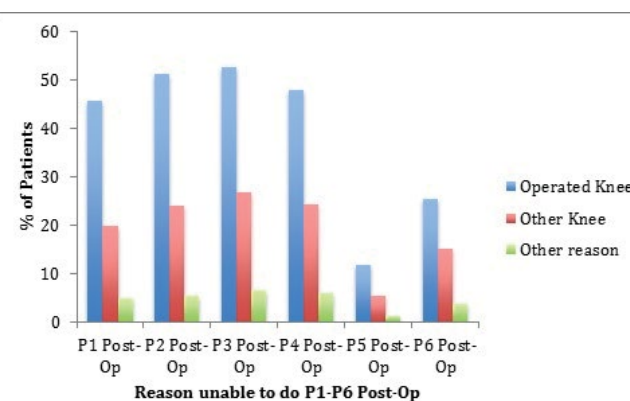




**Figure 7:** Sitting on a low-level seat with knee flexion more than 90 degrees.



**Figure 8:** Pre-operative reasons (other reason=other than knee/knees including medical problems or/and other joint problems).

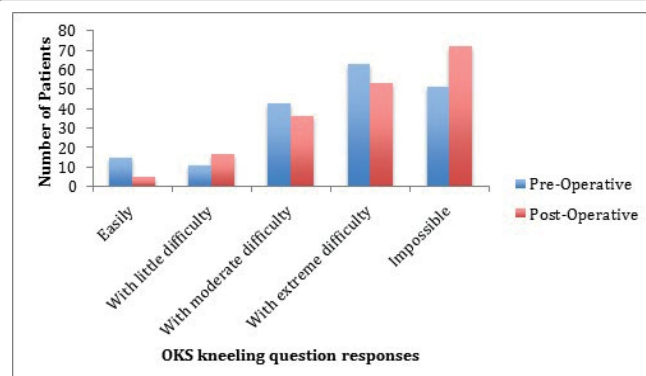


**Figure 9:** Post-operative reasons (other reason=other than knee/knees including medical problems or/and other joint problems).

The correlation calculated between responses to OKS kneeling question and the four positions in the questionnaire (P1, P2, P3, P4) preoperatively and postoperatively resulted in a stronger positive correlation with upright kneeling and high flex kneeling postoperatively which is significant at the 0.01 level (Figures 12-19, Responses to OKS kneeling question: 0=Impossible, 1=with extreme difficulty, 2=with moderate difficulty, 3=with little difficulty, 4=Easily).

	PRE-OP Kneeling (OKS Responses)		POST OP Kneeling (OKS Responses)	
Kneeling Pre-op	N	%	N	%
Easily	15	8%	5	3%
With little difficulty	11	6%	17	9%
With moderate difficulty	43	24%	36	20%
With extreme difficulty	63	34%	53	29%
Impossible	51	28%	72	39%
Total	183	100	183	100

**Table 4:** OKS kneeling question for pre-op and post-op kneeling.



**Figure 10:** OKS kneeling question responses (pre and post-operative).

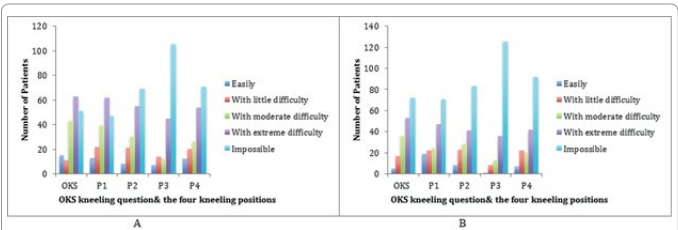
## Discussion

The novelty of current study is that giving an attention to healthcare professionals as well as TKA patients regarding an important knee function question, which remains improperly answered because of limited studies in the literature [11,12]. As the question remains before and after TKA "is kneeling safe and viable function after TKA?" the questionnaire design on kneeling ability in need of further review and more scientifically based answer should be given to all TKA patients specially in culture with high kneeling activities. This study provide insight into the differences in the definition of the kneeling patterns in population with different demands on knee flexion, the information could guide the design of new assessment tools that will be culturally appropriate in all respects and include all kneeling patterns in a clearer way [13]. A culturally appropriate questionnaire's design has a greater chance of being successful in meeting an individual's needs and a more reliable tool for assessment of kneeling function.

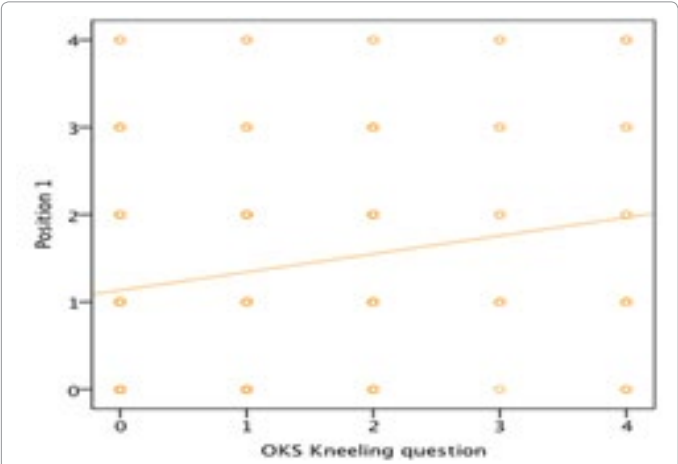
The disadvantage of using patient-based questionnaires to analyse function is that the scores are greatly influenced by pain and patients' perception of their immediate functional outcome [14].

There are a few limitations with this research. Self-reporting is a limitation, the study could benefit from a larger sample and also retrospective measurement, which relies on the recollection of pre-surgery status, could be deemed a limitation but it is often used to establish the baseline in outcomes research. This is considered justified, especially if measuring physical function.

The ROM at 1 year is considered to be an appropriate end point as little or no improvement in the range of knee motion has been reported after that [7,15]. The findings of the questionnaire concur with those authors who suggest that the most important factor in influencing the range of motion after TKA is the preoperative value [7,16,17]. In a

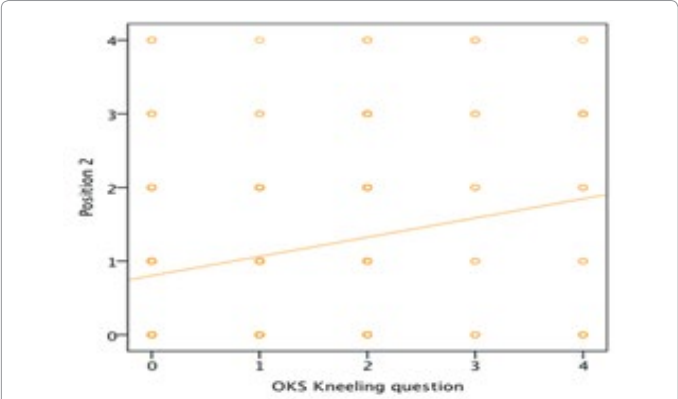


**Figure 11:** A. The pre-op responses-OKS kneeling question and this thesis's kneeling questionnaire. B. The post-op responses-OKS kneeling question and this thesis's kneeling questionnaire.



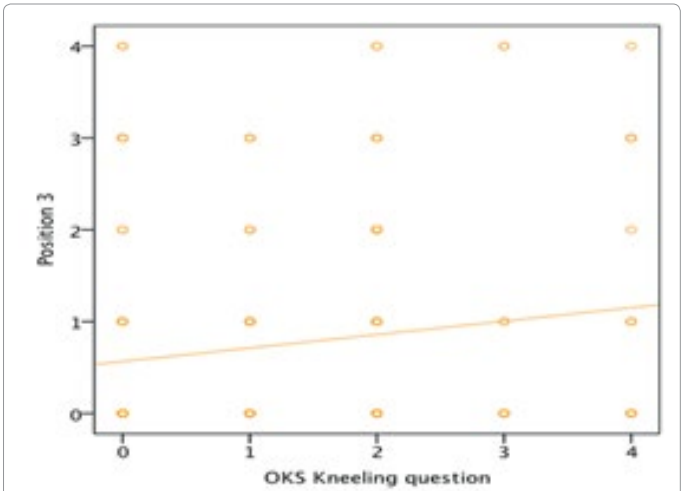
Pre-Op Score	OKS	%	P1	%
0	51	27.7	47	25.5
1	63	34.2	62	33.7
2	43	23.4	39	21.2
3	11	6.0	22	12.0
4	15	8.2	13	7.1

**Figure 12:** Correlation between pre-operative OKS kneeling question's responses and P1. Position-pearson correlation  $r=0.2$ ,  $P=0.005$ .



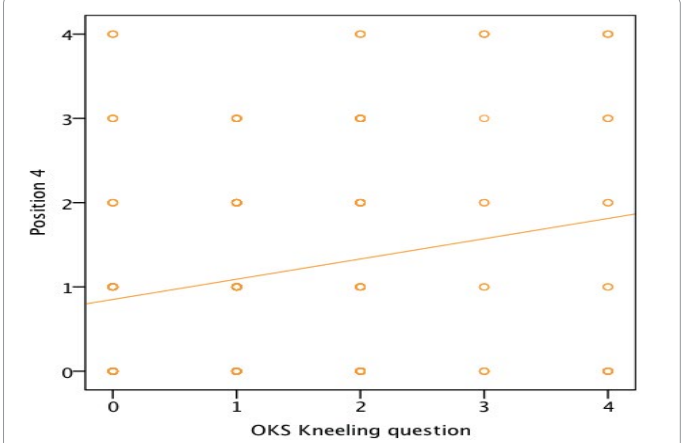
Pre-Op Score	OKS	%	P2	%
0	51	27.7	69	37.5
1	63	34.2	55	29.9
2	43	23.4	30	16.3
3	11	6.0	21	11.4
4	15	8.2	8	4.3

**Figure 13:** Correlation between pre-operative OKS kneeling question's responses and P2 position-pearson correlation  $r=0.2$ ,  $P=0.0001$ .



Pre- Op Score	OKS	%	P3	%
0	51	27.7	105	57.1
1	63	34.2	45	24.5
2	43	23.4	12	6.5
3	11	6.0	14	7.6
4	15	8.2	7	3.8

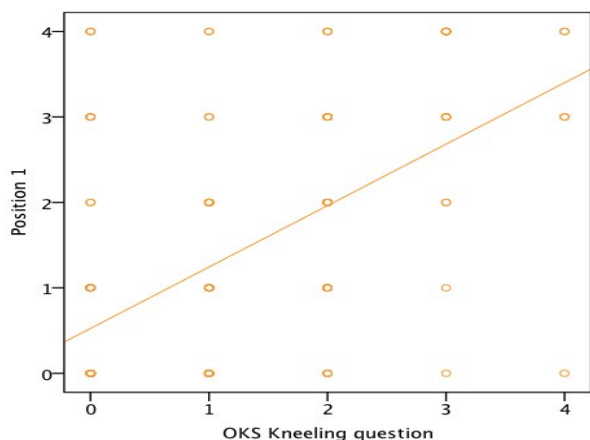
**Figure 14:** Correlation between pre-operative OKS kneeling question's responses and P3 position-pearson correlation  $r=0.1$ ,  $p=0.03$ .



Pre-Op Score	OKS	%	P4	%
0	51	27.7	71	38.6
1	63	34.2	54	29.3
2	43	23.4	26	14.1
3	11	6.0	20	10.9
4	15	8.2	12	6.5

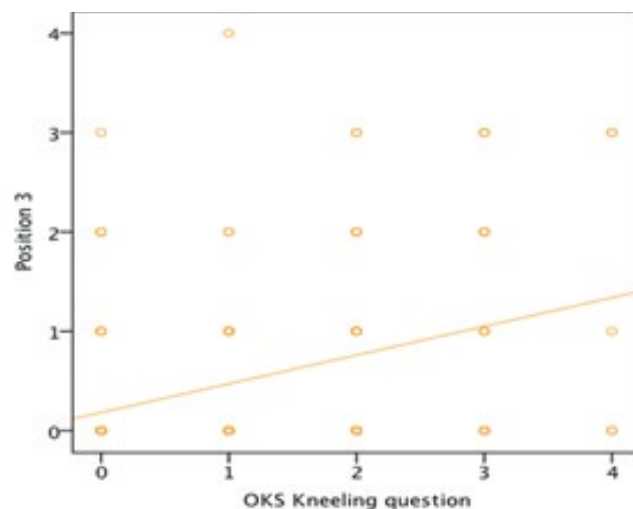
**Figure 15:** Correlation between pre-operative OKS kneeling question's responses and P4 position –pearson correlation  $r=0.2$ ,  $P=0.002$ .

study by Wright et al. [18] that looked at Patient preferences before and after surgery, a Cohort of 119 TKA patients(Primary or revision)were interviewed at two tertiary care hospitals. The Patients also completed the Short Form 36, the Knee Society Scale (KSS), the Western Ontario and McMaster University Osteoarthritis Index (WOMAC), and the McMaster-Toronto Arthritis Patient Preference Disability Questionnaire (MACTAR). The study reported that 42 symptoms and physical limitations improved after TKAs except crouching/kneeling and walking up and down stairs. In another study, which was designed



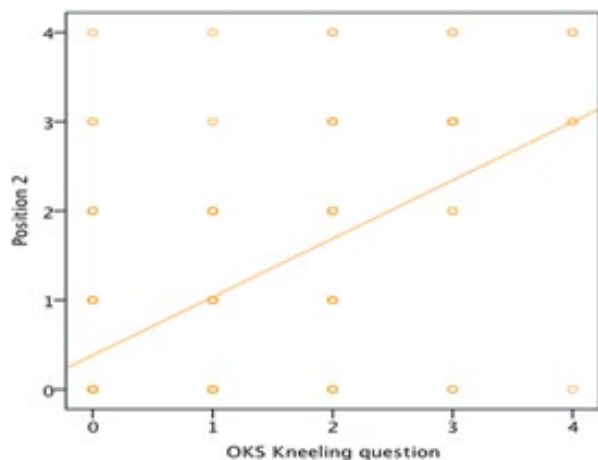
Post-Op Score	OKS	%	P1	%
0	72	39.1	71	38.6
1	53	28.8	47	25.5
2	36	19.6	24	13.0
3	17	9.2	22	12.0
4	5	2.7	19	10.3

**Figure 16:** Correlation between postoperative OKS kneeling question's responses and P1 position- pearson correlation  $r=0.5$ ,  $P=0.0001$ .



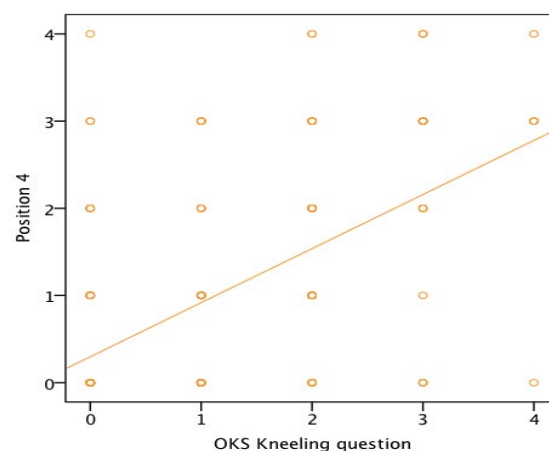
Post-Op Score	OKS	%	P3	%
0	72	39.1	125	67.9
1	53	28.8	36	19.6
2	36	19.6	13	7.1
3	17	9.2	8	4.3
4	5	2.7	1	.5

**Figure 18:** Correlation between postoperative OKS kneeling question's responses and P3 position- pearson correlation  $r=0.3$ ,  $P=0.0001$ .



Post-Op Score	OKS	%	P2	%
0	72	39.1	83	45.1
1	53	28.8	41	22.3
2	36	19.6	28	15.2
3	17	9.2	23	12.5
4	5	2.7	8	4.3

**Figure 17:** Correlation between postoperative OKS kneeling question's responses and P2 position-pearson correlation  $r=0.5$ ,  $P=0.0001$ .



Post-Op Score	OKS	%	P4	%
0	72	39.1	92	50.0
1	53	28.8	42	22.8
2	36	19.6	20	10.9
3	17	9.2	22	12.0
4	5	2.7	7	3.8

**Figure 19:** Correlation between postoperative OKS kneeling question's responses and P4 position- pearson correlation  $r=0.5$ ,  $P=0.0001$ .

to investigate functional disabilities and patient satisfaction in female Korean patients after Total Knee Arthroplasty. 261 out of 372(70.2%) female patients with a follow-up longer than 12 months completed a questionnaire designed to evaluate functional disabilities, importance, and patient satisfaction. The top 5 functional disabilities were difficulties in kneeling, squatting, sitting with legs crossed, sexual activity, and recreational activities. The top 5 in order of importance were difficulties in walking, using a bathtub, working, recreation activities, and climbing

stairs; kneeling was not one of them. Severities of functional disabilities were not found to be correlated with importance. 23 patients (8.8%) never satisfied with their replaced knees and for most activities had more severe disabilities than the patients satisfied. The functional disabilities in high-flexion activities for the dissatisfied patients were more important for them than the satisfied.

The aim of the study to assess the kneeling ability of patients following TKA by using a novel patient based kneeling questionnaire. This study obtained scores for patients' kneeling ability and also compared these results with the kneeling question of the OKS.

There was no significant difference in perceptions of kneeling ability before and after TKA in all kneeling positions.

The OKS kneeling question responses (which were primarily from a Caucasian population) closely matched the upright kneeling patterns (kneeling on operated knee, with the knee at 90 degrees and upright kneeling on both knees). A stronger and significant positive correlation [19] noticed after TKAs compared to preoperative correlation between the kneeling question in OKS and the four patterns of kneeling.

The data suggest that a high percentage of TKA patients experience postoperative kneeling difficulties. According to the knee surgeons at RIE patients are told that kneeling is not advisable for some time following their operation but that they can kneel, as they feel able. They are advised that they may find kneeling uncomfortable and/or painful. The information booklet issued to patients does not give specific advice on kneeling and this could be a reason behind the negative advice given to patients regarding their kneeling ability after TKA (i.e., Nurse practitioner). The negative advice was given to patients regarding kneeling, and the misunderstanding of that advice by patients could be major factors in the low percentage of patients kneeling after knee replacement as 96% were advised by healthcare professionals not to kneel according to the responses reported by TKA patients included in this study. One of the limitations of the study is that it was not possible to include patients from eastern countries who may have different perceptions based on their high flexion activities.

## Conclusion

The OKS kneeling question; "could you kneel down and get up afterwards?" is problematic because of the following factors which were found to affect the patient's responses: The patient told not to kneel by healthcare professionals (e.g. nurses, consultants). Differences in interpretation of the meaning of kneeling by different patients. Thus although the OKS does provide a simple and brief scale for the assessment of outcome after total knee replacement and these scores are quick and easy to calculate and analyse, this study has demonstrated that factors affect the kneeling question of the OKS and thus the total score of OKS. These findings should be taken into account when using the OKS, which is likely to be inconsistent in recording kneeling ability in populations of patients of different cultural backgrounds.

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